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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/082,072	02/26/2002	Tomohiro Yamaguchi	018987-038	5410

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EXAMINER	
PERUNGAVOOR, SATHYANARAYA V	
ART UNIT	**PAPER NUMBER**
2625	

DATE MAILED: 05/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/082,072	YAMAGUCHI, TOMOHIRO	
	Examiner	Art Unit	
	Sath V. Perungavoor	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 March 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR.1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

[1] The response filed on 25 March 2005 has been entered and made of record.

Response to Arguments

[2] Applicant's arguments filed on 25 March 2005 have been fully considered but they are not persuasive. Response to those arguments is presented below.

Objection to the Specification

Summary of Arguments:

Applicant has amended the objected portions in the specification. Applicant requests the withdrawal of the objection [Remarks: Page 6].

Examiner's Response:

Agreed. Examiner withdraws the previously made objection.

Claim Rejections - 35 USC § 103

Summary of Arguments:

Regarding Claims 1 and 8:

Item 1: Applicant alleges, "the value smoothed by Yajima is completely different than an edge enhancement amount" [Remarks: Page 8].

Item 2: Applicant alleges, "Kawai does not show either the smoother 103 or the edge emphasis unit 105 acting on density enhancement amount data (i.e., data separate from the image data). In fact, Kawai does not show density enhancement amount data at all" [Remarks: Page 8].

Examiner's Response:

Examiner's response for Item 1: Examiner respectfully disagrees. Smoothing disclosed with Yajima would inherently smooth the edge enhancement amount. In order to further clarify the Examiner's position, an illustration suggesting that there is no noticeable difference between applicant's invention as claimed and the combination of Kawai and Yajima.

Applicant's invention as claimed:

$\gamma = f(\alpha) + f(\beta)$

γ, enhanced density

α, enhancement amount for edge pixel

β, original image

f, correction function to reduce variation

Combination of Kawai and Yajima:

$\gamma = f[\alpha + \beta]$

γ, enhanced density

α, enhancement amount for edge pixel

β, original image

f, correction function to reduce variation

To further simplify this discussion, lets consider a trivial smoother, a low pass filter.

A two-dimensional low pass filter, *h*, of size *K x L* and with entries *1/(KL)*, that is,

$$h[k,l]=\begin{cases}\dfrac{1}{KL} & -(K-1)/2\le k\le (K-1)/2,-(L-1)/2\le l\le (L-1)/2\\ 0 & \textit{elsewhere}\end{cases}$$

for *K* and *L* both odd.

The terminology "spatial averaging" will be used to indicate the operation of applying the low pass filter. The spatial averaging operation then is given by the equation

$$\hat{x}[m,n]=\sum_{k=-(K-1)/2}^{(K-1)/2}\sum_{l=-(L-1)/2}^{(L-1)/2}x[m+k,n+l]h[k,l]$$

where $x[m,n]$ is the input original image and $\hat{x}[m,n]$ is the output smoothed image. The input image is of size *MxN* with *M* assumed to be significantly greater than *K* and *N* assumed to be significantly greater than *L*. It is also assumed that $x[m,n]$ is zero-padded, that is, for values of $m<0$ and $m>M-1$ and values of $n<0$ and $n>N-1$ the image pixel intensities are set to 0 ($x[m,n]=0$) so that the spatial averaging operation can be applied even at the edges of the image.

Commonly known *3 x 3* low pass filter is of the form:

1/9	1/9	1/9
1/9	1/9	1/9
1/9	1/9	1/9

Consider an example with an image section being:

10	33	20
20	**193**	5
23	15	50

The enhancement amount being:

5	15	3
9	**20**	6
12	6	5

Notice the result of the central pixel using $\gamma = f(\alpha) + f(\beta)$:

$f(\alpha) = 9$

$f(\beta) = 41$

$\gamma = 9 + 41 = 50$

Notice the result of the central pixel using $\gamma = f[\alpha + \beta]$

$\alpha + \beta$ would be:

15	48	23
29	**213**	11
35	21	55

$\gamma = f(\alpha + \beta) = 50$, as can be seen the end result is the same as the applicant's claimed invention.

Examiner's response for Item 2: Examiner's response for Item 1: Examiner respectfully disagrees. Kawai's Figure 2B discloses the enhancement filter used by the edge emphasis circuit 105 to calculate the density enhancement values.

Summary of Arguments:

Regarding Claims 6: Applicant states that arguments presented for claim 1 applies to claim 6 as well. Applicant further argues, "Baxes does not show correction of the first image data that expresses an edge enhancement amount for the target pixel".

Examiner's Response:

Examiner respectfully disagrees. Applicant should refer to the response provided for claim 1. In response to applicant's arguments against the Baxes reference individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[3] Claims 1, 5 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai et al. (hereinafter "Kawai") [US 5,339,365] in view of Yajima et al. (hereinafter "Yajima") [US 4,074,231].

Regarding claim 1, Kawai discloses an image processing apparatus for conducting edge enhancement processing on an original image, comprising *[Fig. 1A: Disclosed is performing edge enhancement with edge emphasis (enhancement) circuit 105.]*: an enhancement amount calculation unit for calculating a density enhancement amount for each edge pixel of the original image, the edge pixel being a pixel in an edge area in the image *[105 on Fig. 1A; Fig. 2B; Col. 5 Line 62; The cited reference discloses the edge emphasis circuit, where enhancement amount calculations are made for the edge pixels. Figure 2B discloses the enhancement filter used to calculate the density enhancement values. This filter provides new values only at the edges of an image.]*; a density processing unit for correcting a density of each edge pixel of the original image in a manner to reduce variations in densities in the overall edge area *[103 on Fig. 1A; Fig. 2A; Smoothing function disclosed corrects the variations in density along the whole image, including the edge area.]*; and a density calculation unit for calculating an enhanced density of each edge pixel from the corrected density and the corrected density enhancement amount *[Equation 1; The equation discloses an enhanced density that is an addition of smoothing and enhancement, which are corrected by the factors α and $(1-\alpha)$.]*.

However, Kawai et al. does not explicitly disclose an enhancement amount processing unit for correcting the density enhancement amount for each edge pixel in a manner to reduce the variations in the density enhancement amounts in the overall edge area.

Yajima does explicitly disclose an enhancement amount processing unit for correcting the density enhancement amount for each edge pixel in a manner to reduce the variations in the density enhancement amounts in the overall edge area *[Col. 6 Lines 24-27: Cited reference discloses smoothing of the edge enhanced image to reduce the variations in density. This would have same effect as the smoothing of enhancement amount and adding that to the original image. Since, the operation is interchangeable, order of execution does not affect the result. The additional feature such as the noise suppressor and it's related components can be removed without affecting the smoothing functionality.]*.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teaching Kawai et al. with Yajima et al. to develop a correction method for enhancement density variations. Smoothing is used to reduce variations and may be used in any situation. Hence, one would use smoothing to reduce the variations in the enhancement amount. Furthermore, smoothing is well known in image processing, some well-known filters that perform smoothing are low-pass and dilating filters.

Regarding claim 5, Kawai et al. discloses an image forming apparatus for forming an image, comprising the image processing apparatus of Claim 1, wherein the image is formed based on image data on which edge enhancement processing has been conducted by the image processing apparatus *[405 on Fig. 4]*.

Regarding claim 8, all claim limitations have been set forth and rejected in the discussion for claim 1.

[4] Claims 2-4, 6-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai view of Yajima as applied to claim 1 above, and further in view of Baxes [NPL document, see PTO-892].

Regarding claim 2, Kawai and Yajima meet the claim limitations as set forth in the discussion for claim 1.

However, neither Kawai nor Yajima expressly disclose the image processing apparatus of Claim 1, wherein the enhancement amount processing unit changes the density enhancement amount for a target pixel in the edge area to a greatest edge enhancement amount in a predetermined area that includes the target pixel and edge pixels surrounding the target pixel.

Baxes discloses a method where the target pixel value is replaced with the greatest pixel value in the predetermined area that includes the target pixel and edge pixels surrounding the target pixels *[Page 142 and Fig. 5.16]*.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Kawai et al. and Yajima et al. with Baxes to change the density of enhancement amount in a target pixel to the greatest value in the predetermined area. Dilation eliminates the variation in the pixel values of an image *[Page 144, Paragraph 4]*. If it were applied to an array of enhancement values or an enhanced image, the effect would be the same.

Regarding claim 3, Kawai and Yajima meet the claim limitations as set forth in the discussion for claim 1.

However, neither Kawai nor Yajima expressly disclose the image processing apparatus of Claim 1, wherein the density processing unit changes the density of a target pixel in the edge area to a greatest density in a predetermined area that includes the target pixel and edge pixels surrounding the target pixel.

Baxes discloses a method where the target pixel value is replaced with the greatest pixel value in the predetermined area that includes the target pixel and edge pixels surrounding the target pixels *[Page 142 and Fig. 5.16]*.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Kawai and Yajima with Baxes to change the density of the target pixel to the greatest value in the predetermined area. Dilation eliminates the variation in the pixel values of an image *[Page 144, Paragraph 4]*. Hence, one would use dilation to reduce variations in density in an image or array.

Regarding claim 4, all claim limitations have been set forth and rejected in the discussion for claims 1-3.

Regarding claim 6, Kawai et al. discloses a judgment unit for judging whether a target pixel is an edge pixel, which is in an edge area, based on the image data *[Fig. 2B; 108 on Fig. 1A]*. All remaining claim limitations have been set forth and rejected in the discussion for claims 1-3.

Regarding claim 7, all claim limitations have been set forth and rejected in the discussion for claims 5 and 6.

Regarding claim 9, all claim limitations have been set forth and rejected in the discussion for claims 2 and 8.

Conclusion

[5] THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

[6] Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Sath V. Perungavoor whose telephone number is (571) 272-7455. The examiner can normally be reached on Monday to Friday from 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Bhavesh M. Mehta whose telephone number is (571) 272-7453, can be reached on Monday to Friday from 9:00am to 5:00pm. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sath V. Perungavoor
Art Unit 2625
May 14, 2005

MEHRDAD DASTOURI
PRIMARY EXAMINER